The Effects of Finasteride on the Parity Rates of Female Drosophila Melanogaster

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Abstract

Finasteride has been used to treat male pattern baldness and benign prostate hyperplasia and could potentially treat female pattern baldness and polycystic ovary syndrome. The effects that finasteride ingestion has on reproduction in female patients is still inconclusive. Using Drosophila melanogaster as a model, this study was designed to investigate the impact of finasteride on female fly reproduction and their offspring. The female flies in this study will be fed dosage equivalents of 0.5 mg, 1 mg, and 5 mg of finasteride, with a control group of females who consume no finasteride. The flies will be allowed to mate after consuming their respective dose of the drug and the viable offspring will be counted for ten days after the first birth. Additionally, viable male offspring will be allowed to mate with female flies to determine if they are impacted by the drug. This study predicts the results will indicate that finasteride will impact the reproductive ability of the females and their male offspring. We will support these results by using an RNA sequencer to investigate their genome. These results will further the database that could lead to determining if finasteride could be used to treat the disorders in human females.

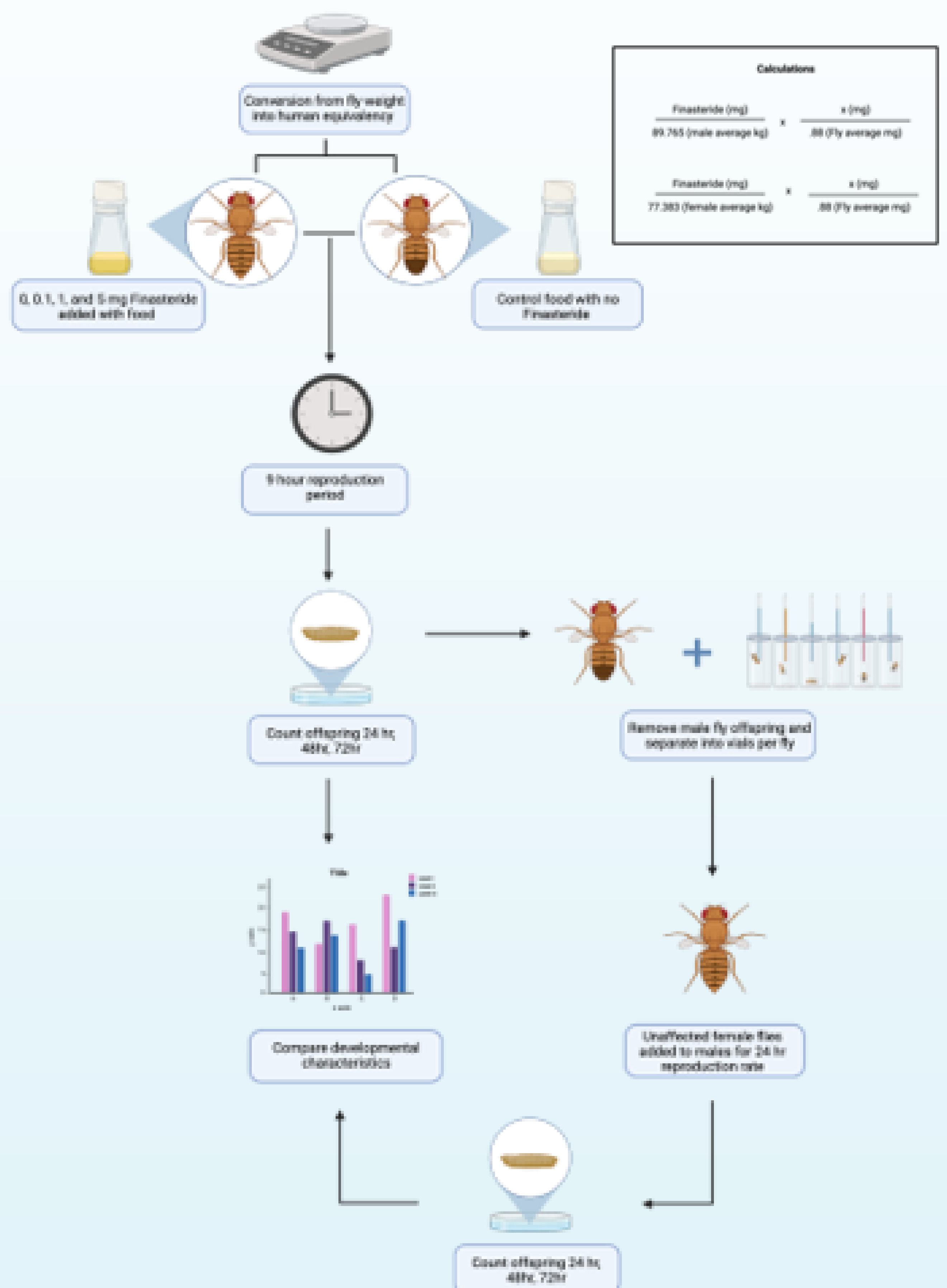
Introduction

Finasteride, a 5-alpha-reductase inhibitor, is a type of drug often used for benign prostatic hyperplasia (BPH) in men. The second of two types of 5-alpha-reductase is isoenzyme, this major enzyme is found in the prostate gland, and it is the only one affected by finasteride (Khandalavala & Do, 2016). 5-alpha-reductase is the enzyme responsible for the conversion of testosterone into dihydrotestosterone (DHT) (Steiner, 1996). DHT is a male sex hormone that stimulates male characteristics like hair growth and prostate enlargement. Varied levels of DHT can be detrimental, as an uneven balance of the hormone will have negative impacts opposite of its intended function. When finasteride is consumed, it acts to inhibit the action of 5-alpha-reductase, resulting in an increase in testosterone. To reiterate, 5-alpha-reductase is directly involved in the role of hair growth, and while a rare occurrence, finasteride has the potential to pose adverse side effects in humans. The largest of these side effects is the dysregulation of normal sexual characteristics in men. Finasteride tends to be administered orally, but a new breakthrough has been the development of a topical finasteride spray solution. When administering finasteride topically rather than orally, sexually associated dysfunction risks were lowered (Piraccini et al., 2021). Going forward, this drug could have similar benefits for women suffering from hair loss disorders, as long as serious sexual reproductive disorders do not arise from its use.

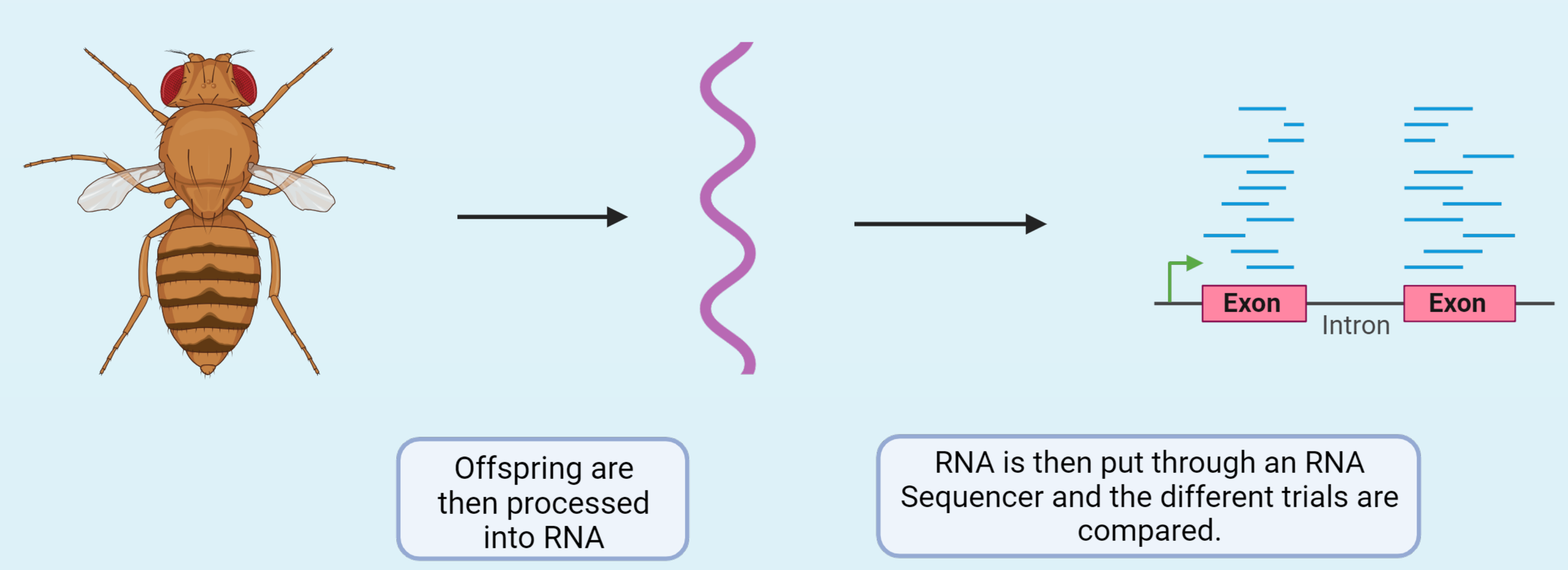
A major concern for women taking finasteride is teratogenicity, as the drug has currently been categorized as a major pregnancy risk (Khandalavala & Do, 2016). From this, finasteride must be administered with contraceptives to reduce the potential for pregnancy (Hu et al., 2019). Finasteride in men does escape the body through seminal concentration and can potentially impact women indirectly. However, concentrations of finasteride in male seminal fluid are often low and sometimes undetectable. Keeping this in mind, medical professionals still recommend couples that find themselves expecting and have traceable concentrations of finasteride in seminal fluid exercise extreme caution to avoid fetal exposure. Exposure could cause serious birth defects and other abnormalities.

To study these potential side effects on women, drosophila flies were exposed to finasteride and allowed to go through gestation cycles. The rapid generation rate of this homologue enables downstream effects of the drug to be visualized quicker, along with the ease of genetic sequencing. The sequencing conducted will determine if finasteride can cause epigenetic changes in organisms.

Methodology

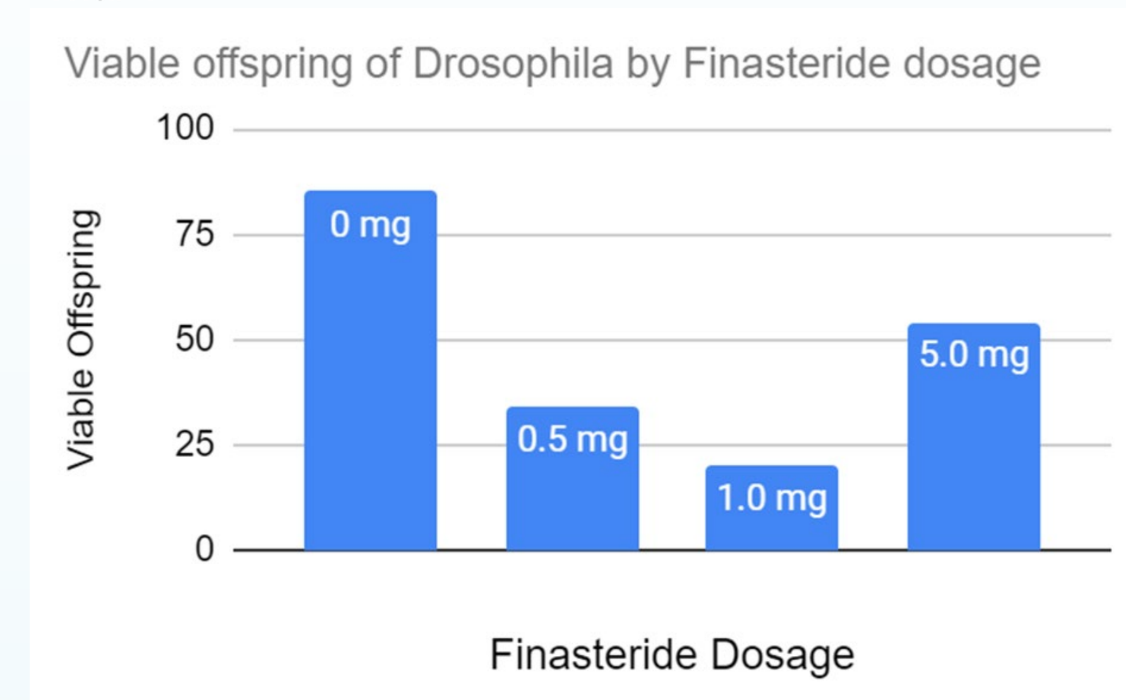


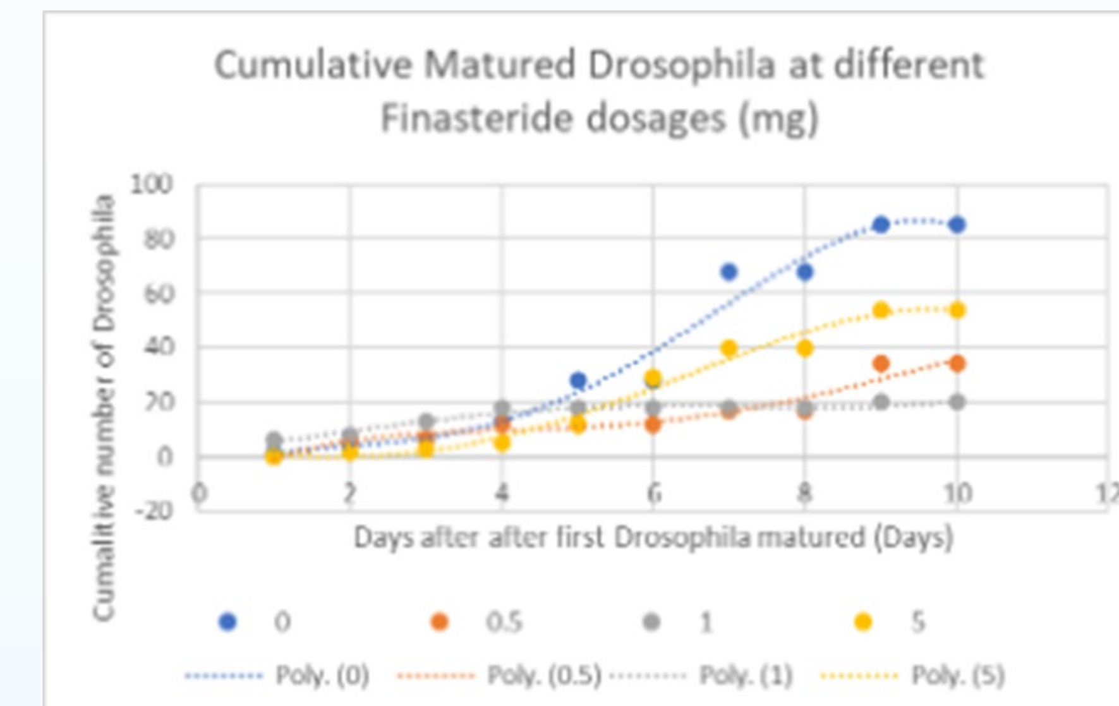
Future Direction



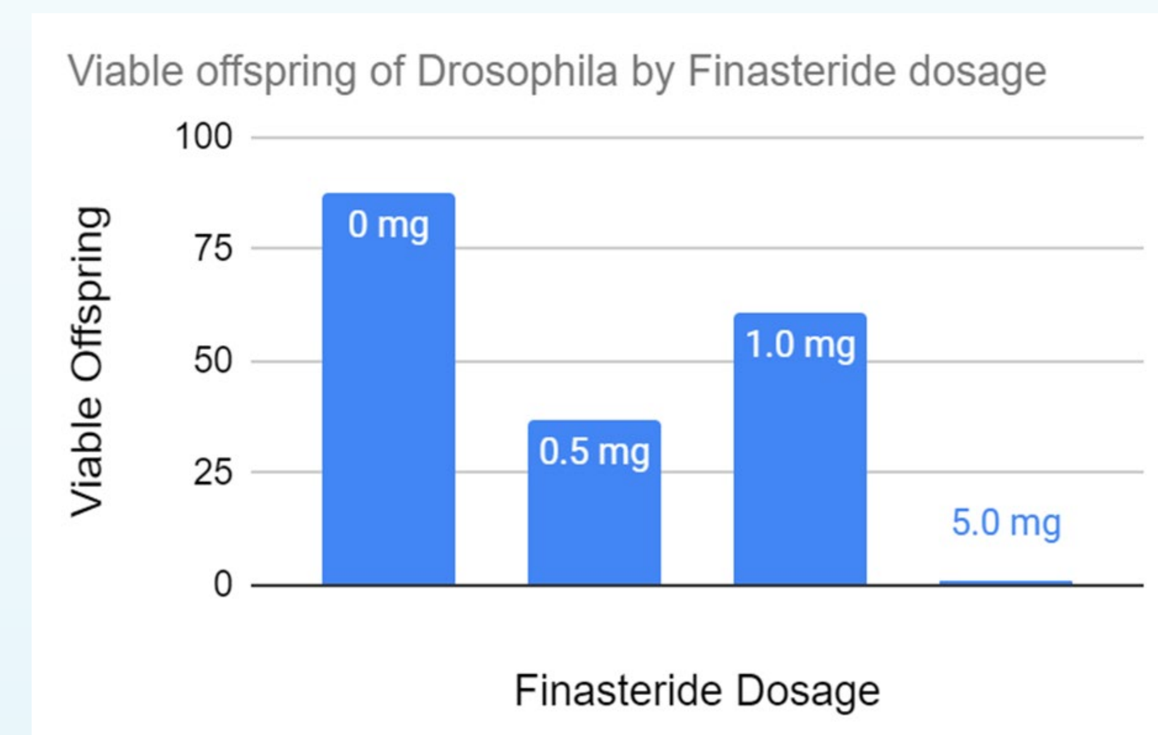
Results

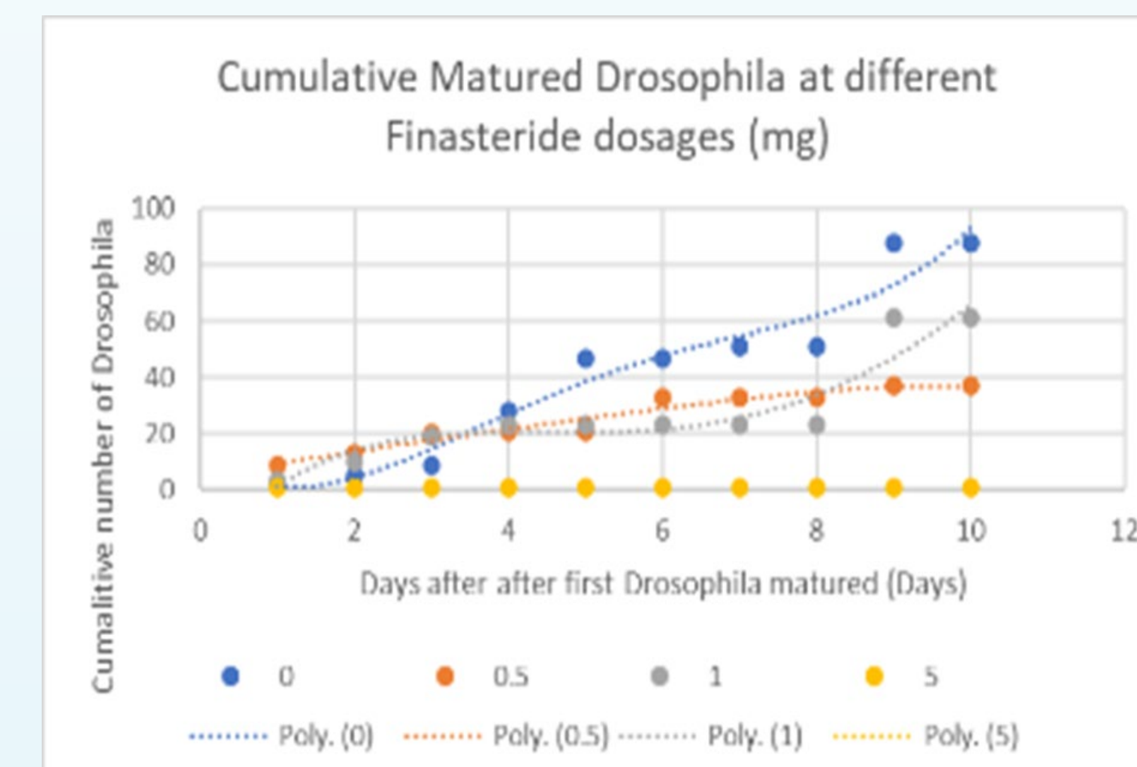
Trial 1



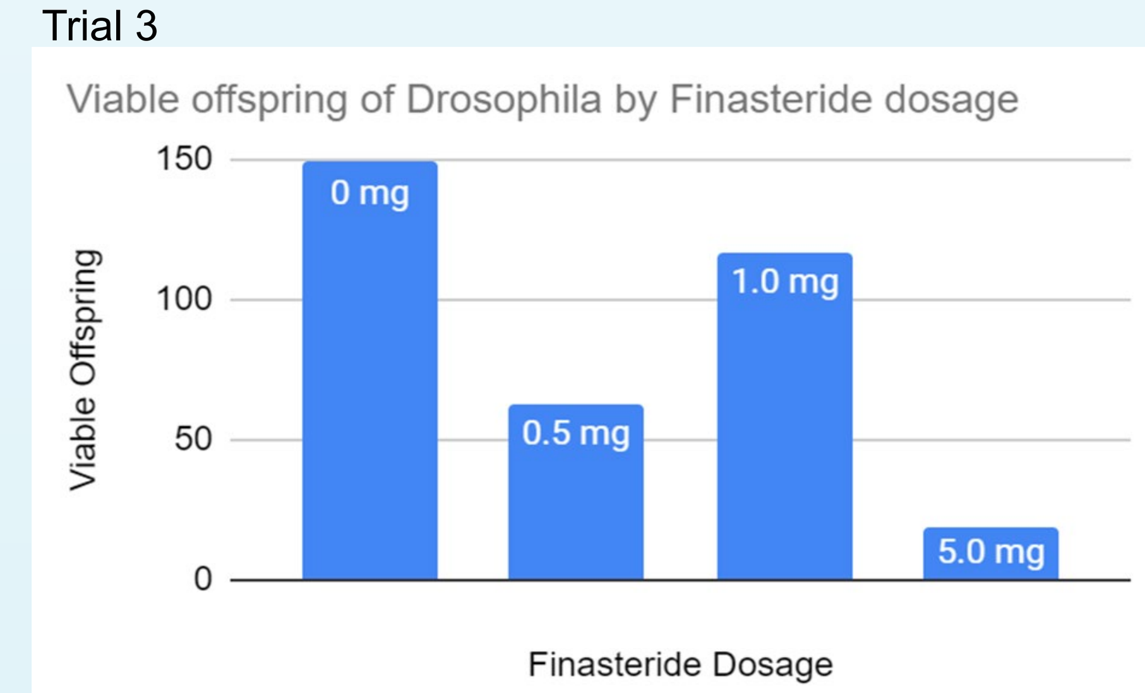


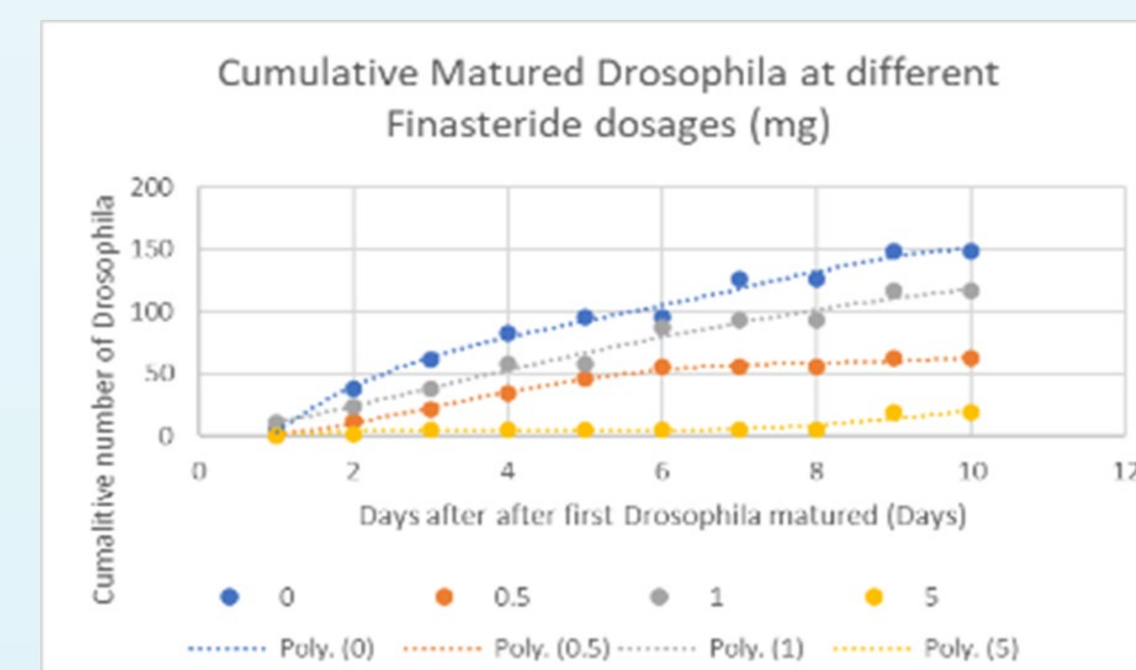
Trial 2





Trial 3





Discussion

- In Trial 1, the number of viable offspring decreased an exponential amount as the finasteride concentration increased, until the 5.0 mg amount where the number of viable offspring increased dramatically.
- In Trial 2, the number of viable offspring drastically decreased for the 0.5 mg concentration of Finasteride. However, the number of viable offspring from the 1.0 mg concentration of Finasteride were relatively close to the viable offspring of the control group
- These results show that there is a relationship between dosage amounts and parity rates.
- The only way there would not be a relationship if the viable number of offspring was the nearly the exact same for all trials.
- Trials will be re-done so the results can be more conclusive
- One factor that may have affected results was that female flies retent semen in their bodies for several days, which could prove fatal to the offspring

References

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